NOTES AND EXTRACTS.

FORMATION OF HAILSTONES.

A recent letter from Mr. William M. Taylor, at Guthrie, Okla., forwarded by Section Director C. M. Strong, describes a thunder and hailstorm as follows:

In the spring of 1868, at Arlington, Okla., I had the pleasure of observing a severe electrical and hailstorm. From 4 to 5 p. m. there was a continuous flashing of lightning, mostly forked, with very little thunder. About 6 p. m. it commenced to hail; the sky had a greenish cast and before the hail began to fall a rumbling noise was heard like stones clashing together. The first hail that fell was small, about the size of birds' eggs, but as the storm advanced they grew larger, until some of them crashed through the roof of the hotel and other buildings, including the roof of my shop, which was covered with three thicknesses of oak boards and had a slope of one in four. I examined several of these hailstones; one of them measured 3½ by 4½ inches in diameter. One was weighed by a friend and weighed 14 ounces. I broke several of them open to see their interior formation. The smallest had a center of white ice, with a coating of clear ice surrounding it. The next larger size was like the first, with an additional coat of white ice, and on that a coat of clear ice. Each successive larger size had additional double coats of white ice and clear ice. The largest had five double coats besides the center.

Although it has long been known that large hailstones are formed of concentric layers of clear ice and snowy ice, and although Espy and Ferrel long since plausibly explained this concentric formation on the assumption that the hailstones were carried alternately from the altitude called "rain stage" through the layer called "hail stage" into the upper layer known as the "snow stage" and back again, several times, we have not yet attained to what may be called a perfect demonstration of the truth of this very plausible hypothesis. In Ferrel's Recent Advances (Washington, 1885), and elsewhere, he has given some drawings illustrating his idea on the subject. His drawing on page 309 appears to suggest that hailstones of the larger size may be carried from the height of 2000 meters up to 8000 and back again over and over, until they have acquired a number of concentric coatings of ice and snow, but this is an extreme case and quite unnecessary. The beautiful graphic methods of Herz and von Bezold, and the more elaborate tables published by Professor Bigelow, or the new diagrams published by Neuhoff, show that for any given condition of the atmosphere the so-called hail stage, in which raindrops are freezing into ice, occupies only a thin horizontal layer somewhere in the midst of an ordinary cumulus cloud, and this layer is at the most only a few hundred meters thick. Therefore, a hailstone need only go up and down vertically a few hundred meters, in order to receive a layer of snow or white ice, and down again a few hundred meters in order to acquire a layer of cold water. This vertical oscillation need not be represented by a curve like AB, followed by the direct fall to the ground BC, but rather resembles a curve, XYZ, such as would be described by a particle drawn in from a great distance outside of the storm at X and gradually ascending into the interior of the cumulus cloud at Y before it is brought to the ground at Z by its increasing weight. The altitude at which the hail stage occurs depends upon the temperature and humidity of the air, and is somewhat higher in the interior of the cloud than at its exterior, as represented by the stratum HH in fig. 1.

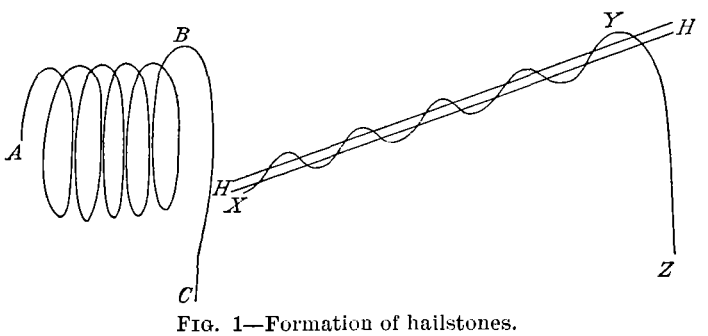

FIG. 1—Formation of hailstones.

WEATHER BUREAU MEN AS INSTRUCTORS.

Prof. Henry J. Cox, in charge at Chicago, states that classes in physiography in the schools of Chicago and vicinity frequently visit the office of the Weather Bureau. Fourteen such visits occurred during 1903. One of these classes was from the University of Chicago, another, a class in physics, from the Young Men's Christian Association Technical School, and the remainder were from the high schools and normal schools of Chicago. On each occasion a lecture was delivered, either by Professor Cox or by one of his assistants, upon the working of the Weather Bureau instruments, the methods employed in forecasting, etc.

On December 16, 1903, Mr. D. A. Seeley, Observer, lectured before the Oakland Culture Club at one of its regular monthly meetings on "Meteorology and Weather Forecasting."

Mr. Weston M. Fulton, Local Forecaster, reports the delivery of a lecture at Chattanooga, Tenn., on December 18. Between 2000 and 2500 persons were present, and considerable interest was manifested in the subject.

Mr. J. R. Weeks, Observer, Weather Bureau, Macon, Ga., delivered the first of a series of lectures December 23 before the students of the Gresham High School on "The Weather and the Weather Bureau."

METEOROLOGY AND THE ART OF FLYING.

During the past four years a series of most interesting experiments have been going on on the coast of Dare County, N. C., not far from the Weather Bureau station at Kittyhawk. Here the brothers, Wilbur and Orville Wright, of Dayton, Ohio, have established a camp and all the necessary apparatus for experiments in what is known as gliding flight. The apparatus, which is a form of aeroplane, is launched from the summit of a sand hill, and after making a long glide finally comes to rest on the sands below. After several years of experience and careful study of the currents and winds that blow over the sand hills, the Messrs. Wright have applied motor machinery to their aeroplanes. Their success is undoubtedly due in great part to the preliminary careful study of the winds, and for this reason, although machinery is essential, yet we consider that meteorology also has played an important part in their work. Their latest official announcement is that on December 17 four flights were made. The wind record at Kittyhawk was 24 to 27 miles per hour at 30 feet above the ground, but at the flying station it was about 22 miles per hour at 4 feet above ground. These flights were made from the level ground, against the wind, with no assistance from gravity: after a horizontal run of 40 feet the aeroplane rose with the operator on a very gentle incline to a height of 8 or 10 feet from the ground, after which the course was kept as nearly horizontal as the wind gusts and the limited skill of the operator would permit, and the flyer made its way forward with a speed of 10 miles per hour over the ground, or 30 to 35 miles per hour relative to the air. The fourth flight occupied 59 seconds and the machine flew through a distance of 852 feet over the ground, or about three times that distance relative to the wind; it landed earlier than was necessary, owing to a slight error of judgment on the part of operator.

The Messrs. Wright state:

It had not been our intention to make any detailed public statement concerning the private trials of our power "Flyer" on the 17th of December last; but since the contents of a private telegram, announcing to our folks at home the success of our trials, was dishonestly communicated to newspaper men at the Norfolk office, and led to the imposition upon